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Correlated Fluctuations of DNA Between Nanofluidic Traps
ALEXANDER KLOTZ, LYNDON DUONG, MIKHAIL MAMAEV, WALTER REISNER, McGill Univ — Nanoconfined polymer physics has been the subject of intense investigation, yet experimental efforts have focused almost exclusively on quantifying equilibrium confined chain conformation in simple nanoslit (2D) and nanochannel (1D) geometries. Complex nano environments, defined as spaces composed of interlinked nanoscale regions of varying confinement and dimensionality, are also technologically significant and have qualitatively distinct physics. Here, a single DNA molecule is suspended between two adjacent nanocavity structures embedded in an open nanoslit. A portion of the molecule occupies each cavity with a third linker segment connecting the two. Contour fluctuates between the cavities, giving rise to observed fluctuations in the fluorescence intensity measured for each cavity. Cross-correlation of the time-dependent cavity intensities enables a noise insensitive measurement of the relaxation times for the segmental transfer modes. We explore how these relaxation times scale with cavity width and spacing and compare our results to a simple free energy model incorporating a slit-dependent linker spring energy and cavity self-exclusion cost.

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